



# 74th STLE Annual Meeting and Exhibition

MAY 19-23, 2019

OMNI NASHVILLE HOTEL

NASHVILLE, TENNESSEE (USA)

- Technical Sessions
- Exhibitors
- Education Courses
- Commercial Marketing Forum
- Student Poster Competition
- Keynote Session
- Special Events
- Networking Opportunities

STLE 365 app



Annual Meeting  
section sponsored by  
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[www.stle.org](http://www.stle.org)  
#STLE2019





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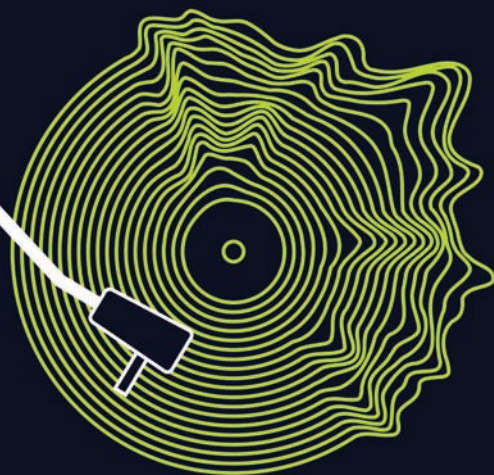
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# nashville TENNESSEE

May 19-23, 2019 • Omni Nashville Hotel

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The 2019 STLE Annual Meeting & Exhibition is sponsored by the Society of Tribologists and Lubrication Engineers, an international organization headquartered at 840 Busse Highway, Park Ridge, Illinois (USA) 60068-2376. Telephone: (847) 825-5536.

Fax: (847) 825-1456. Email: [information@stle.org](mailto:information@stle.org). Web: [www.stle.org](http://www.stle.org).

STLE is a not-for-profit professional society founded in 1944 to advance the science of tribology and best practices in lubrication engineering.





## MESSAGE FROM THE STLE PRESIDENT

*Welcome to Nashville and five days of education, training and networking.*

Dear Members, Friends and Guests,

### **Welcome to STLE's 74th Annual Meeting & Exhibition!**

Two key STLE committees, the **Annual Meeting Program Committee** and the **Education Committee** have assembled a fantastic technical program featuring more than **500 paper presentations**. You can look forward to an outstanding week of professional development here in Nashville, one of the premier convention cities in the U.S. All Annual Meeting events are conveniently located in the Omni Nashville Hotel.

In addition to the technical sessions, the meeting features **12 one-day education courses** (offered on Sunday and Wednesday) and the popular **Commercial Marketing Forum**, where the lubricant industry's most innovative companies discuss their latest products and services.

Don't forget to check out the 2019 **trade show**, and visit with nearly 120 companies displaying the lubricant industry's newest technologies, products and services. The exhibit hall is completely sold out, as this is an opportunity to engage with the industry's leading companies that are looking to do business with you. Also, you are invited to attend the **Exhibitor Appreciation Hour**, with two hours of dedicated exhibit time on Monday and Tuesday (3-4 pm). Refreshments will be served, and the trade show is the only annual meeting activity conducted at that time.

Remember, too, to take advantage of the social events, including the **Networking Reception** Monday at 6:30 pm and the **President's Luncheon** noon Tuesday, both in the Legends Ballroom (Level 2). Come connect with the entire STLE community, as we recognize this year's award recipients and the society's top volunteers who generously have donated their time and services to create new programs for all of us involved in the science of tribology and the practice of lubrication engineering.

To help navigate your investment and time here in Nashville, use this **Program Guide** and the Annual Meeting section of STLE's 365 app (under the Events Apps section). The STLE 365 app can be downloaded for free at [www.tripbuilder.com/apps/stle365](http://www.tripbuilder.com/apps/stle365), or from the App Store (Apple products) or the Play Store (Android products). The app will have the most up to date annual meeting information throughout the week.

As you'll see on the following pages, STLE's 2019 Annual Meeting & Exhibition offers an unparalleled opportunity to discover technical concepts and make personal contacts that will help you save money for your organization and better serve your customers.

Lastly, this year STLE is celebrating its 75th anniversary with a series of events that will carry through the 2019 STLE Annual Meeting and culminate at the 2020 STLE Annual Meeting in Chicago, the society's birthplace. All STLE individual and corporate members will have an opportunity to participate in the celebrations.

If you are an STLE member, our board thanks you for your support. We pledge to continue creating services that advance your technical education and develop your professional skills.

If you are not an STLE member, I invite you to join our community in 2019. You'll soon learn why members say STLE is big enough to make a difference but small enough to be personal.

**Have a great week in Nashville, and enjoy the Annual Meeting!**



*Greg*

**Gregory Croce**

2018-2019 STLE President, Chevron Products Co.





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## 2019 PROGRAM SCHEDULE AT A GLANCE

*Preliminary as of April 23, 2019*

### SUNDAY, MAY 19

**Registration** (7 am – 6 pm) – Second Level Omni Foyer

**Education Course Faculty Breakfast** (7 – 7:45 am) – Legends D

**Sunday Education Courses\*** (8 am – 5 pm)

- ABMA Bearings – Cumberland 4
- Advanced Lubrication 301: Advanced Additives – Cumberland 5/6
- Advanced Tribology 310: Nanotribology – Mockingbird 1
- Automobile Lubrication 201: Diesel – Cumberland 1
- Biolubricants and Biofuels – Cumberland 2
- Hydraulics 201: Hydraulic Fluids and Systems Overview – Cumberland 3
- Metalworking Fluids 115: Metal Removal Fluids – Legends B
- Synthetic Lubricants 203: Non-Petroleum Fluids and Their Uses – Legends C

### MONDAY, MAY 20

**Registration** (7 am – 6 pm) – Second Level Omni Foyer

**Monday Speakers Breakfast** (7 – 7:45 am) – Legends D

**Monday Technical Sessions** (8 – 10 am)

- 1A ● Materials Tribology I – Legends A
- 1B ● Lubrication Fundamentals I – Legends B
- 1C ● Engine and Drivetrain I – Special Session on Electric Vehicles – Legends C
- 1D ● Gears I – Music Row 1
- 1E ● Commercial Marketing Forum I – Music Row 5
- 1G ● Wind Turbine Tribology I – Music Row 3
- 1J ● Nanotribology I – Cumberland 3
- 1K ● Metalworking Fluids I – Cumberland 4
- 1L ● Nonferrous Metals I – Cumberland 5
- 1M ● Fluid Film Bearings I – Cumberland 6

**Opening General Session** (10:30 am – Noon)

- **Keynote Address** – Legends Ballroom
- **Speaker:** Jeff Hemphill, Chief Technical Officer, Americas, Schaeffler Group USA Inc.

**Lunch** on your own (Noon – 1:30 pm)

**Commercial Exhibits and Student Posters**

(Noon – 5 pm) – Broadway Ballroom

**Monday Technical Sessions** (1:30 – 6 pm)

- 2A ● Materials Tribology II – Legends A
- 2B ● Lubrication Fundamentals II – Legends B
- 2C ● Engine & Drivetrain II – Special Session on Electric Vehicles – Legends C
- 2D ● Gears II – Music Row I
- 2E ● Commercial Marketing Forum II – Music Row 5
- 2G ● Wind Turbine Tribology II – Music Row 3
- 2H ● Testing in Soft Tribology – Tribotesting & Materials Joint Session – Music Row 2
- 2J ● Nanotribology II – Cumberland 3
- 2K ● Metalworking Fluids II – Cumberland 4
- 2L ● Nonferrous Metals II – Cumberland 5
- 2M ● Fluid Film Bearings II – Cumberland 6

**Beverage Break** (10 – 10:30 am) – Legends Ballroom Foyer

**Exhibitor Appreciation Break** (3 – 4 pm) – Broadway Ballroom

**Networking Reception** (6:30 – 8 pm) – Legends Ballroom

### TUESDAY, MAY 21

**Registration** (7 am – 6 pm) – Second Level Omni Foyer

**Tuesday Speakers Breakfast** (7 – 7:45 am) – Legends D

**Commercial Exhibits and Student Posters**

(9:30 am – Noon & 2 – 5:30 pm) – Broadway Ballroom

**Tuesday Technical Sessions** (8 am – Noon)

- 3D ● Wear I – Music Row 1
- 3E ● Commercial Marketing Forum III – Music Row 5
- 3F ● Metalworking Fluids III – Music Row 4
- 3G ● Tribotesting I – Music Row 3
- 3H ● Fluid Film Bearings III – Music Row 2
- 3I ● Engine and Drivetrain I – Cumberland 1/2
- 3J ● Nanotribology III – Cumberland 3
- 3K ● Environmentally Friendly Fluids I – Cumberland 4
- 3L ● Lubrication Fundamentals III – Cumberland 5
- 3M ● 2D Materials I – Materials & Nanotribology Joint Session – Cumberland 6

**President's Awards Luncheon/Business Meeting**

(Noon – 2 pm) – Legends Ballroom

## **Tuesday Technical Sessions (2 – 6 pm)**

- 4D ● Wear II – Music Row 1
- 4E ● Commercial Marketing Forum IV – Music Row 1
- 4F ● Metalworking Fluids IV – Music Row 4
- 4G ● Tribotesting II – Music Row 3
- 4H ● Materials Tribology III – Music Row 2
- 4I ● Engine and Drivetrain II – Cumberland 1/2
- 4J ● Nanotribology IV – Cumberland 3
- 4K ● Environmentally Friendly Fluids II – Cumberland 4
- 4L ● Lubrication Fundamentals IV – Cumberland 5
- 4M ● 2D Materials II – Materials & Nanotribology Joint Session – Cumberland 6
- 4N ● Discussion Roundtables – Legends A

**Beverage Break** (10 – 10:30 am) – Broadway Ballroom

**Exhibitor Appreciation Break** (3 – 4 pm) – Broadway Ballroom

## **WEDNESDAY, MAY 22**

**Registration** (7 am – 6 pm) – Second Level Omni Foyer

**Wednesday Speakers Breakfast** (7 – 7:45 am) – Legends D

### **Commercial Exhibits & Student Posters**

(9:30 am – Noon) – Broadway Ballroom

### **Wednesday Education Courses\*** (8 am – 5 pm)

- Advanced Lubrication 302: Advanced Lubrication Regimes – Legends A/B
- Basic Lubrication 103 – Legends C
- Metalworking Fluids 130: Metal Treating, Cleaning and Protecting Fluids – Legends E
- Synthetic Lubricants 204: Basestock Selection and Applications – Legends G

### **Wednesday Technical Sessions (8 am – Noon)**

- 5A ● Rolling Element Bearings I – Legends F
- 5B ● Wear III – Music Row 1
- 5C ● Commercial Marketing Forum V – Music Row 5
- 5D ● Joint STLE/CTI Symposium of Frontiers of Tribology Research I: Design – Music Row 4
- 5E ● Tribotesting III – Music Row 3
- 5F ● Synthetic and Hydraulic Lubricants I – Music Row 2
- 5G ● Engine and Drivetrain III – Cumberland 1/2
- 5H ● Nanotribology V – Cumberland 3
- 5I ● Surface Engineering I – Cumberland 4
- 5J ● Lubrication Fundamentals V – Cumberland 5
- 5K ● Tribology of Biomaterials – Biotribology & Materials Joint Session – Cumberland 6

**Lunch** on your own (Noon – 1:30 pm)

### **Wednesday Technical Sessions (1:30 – 6 pm)**

- 6A ● Rolling Element Bearings II – Legends F
- 6B ● Biotribology I – Music Row 1
- 6C ● Commercial Marketing Forum VI – Music Row 5

- 6D ● Joint STLE/CTI Symposium on Frontiers of Tribology Research II: Lubricant and Chemistry – Music Row 4
- 6E ● Tribochemistry I – Materials & Nanotribology Joint Session – Music Row 3
- 6F ● Synthetic and Hydraulic Lubricants II – Music Row 2
- 6G ● Engine and Drivetrain IV: Special Panel: Advanced Fuel Efficiency, Engine and Drivetrain Hardware Technologies – Cumberland 1/2
- 6H ● Nanotribology VI – Cumberland 3
- 6I ● Surface Engineering II: Additive Manufacturing – Cumberland 4
- 6J ● Lubrication Fundamentals VI – Cumberland 5
- 6K ● Condition Monitoring I – Cumberland 6

**Beverage Break** (10 – 10:30 am) – Broadway Ballroom

**Beverage Break** (3 – 3:30 pm) – Second Level Omni Foyer

## **THURSDAY, MAY 23**

**Registration** (7 am – Noon) Second Level Omni Foyer

**Thursday Speakers Breakfast** (7 – 7:45 am) – Legends A

**STLE Certification Exams** (8:30 am – 12:30 pm) – Mockingbird 2

### **Thursday Technical Sessions (8 am – Noon)**

- 7A ● Rolling Element Bearings III – Legends F
- 7B ● Biotribology II – Music Row 1
- 7C ● Power Generation I – Music Row 5
- 7E ● Tribochemistry II – Materials & Nanotribology – Joint Session – Music Row 3
- 7F ● Synthetic and Hydraulic Lubricants III – Music Row 2
- 7G ● Grease I – Cumberland 1
- 7H ● Materials Tribology IV – Cumberland 2
- 7I ● Contact Mechanics I – Cumberland 3
- 7J ● Surface Engineering III: Surface Texturing – Cumberland 4
- 7K ● Lubrication Fundamentals VIII – Cumberland 5
- 7L ● Condition Monitoring II – Cumberland 6

**Lunch** on your own (Noon – 1:30 pm)

### **Thursday Technical Sessions (1:30 – 6 pm)**

- 8A ● Rolling Element Bearing IV – Legends F
- 8B ● Biotribology III – Music Row 1
- 8C ● Power Generation II – Music Row 5
- 8D ● Seals I – Music Row 4
- 8E ● Tribochemistry III – Materials and Nanotribology – Joint Session – Music Row III
- 8G ● Grease II – Cumberland 1
- 8H ● Materials Tribology V – Cumberland 2
- 8I ● Contact Mechanics II – Cumberland 3
- 8J ● Surface Engineering IV – Cumberland 4
- 8K ● Engine and Drivetrain V – Cumberland 5
- 8L ● Condition Monitoring III – Cumberland 6

**Beverage Break** (10 – 10:30 am) – Second Level Omni Foyer

**Beverage Break** (3 – 3:30 pm) – Second Level Omni Foyer



## 2019 TECHNICAL SESSIONS INDEX

*Preliminary as of April 23, 2019*

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1B • Lubrication Fundamentals I .....	30
1C • Engine and Drivetrain I Special Program on Electric Vehicles .....	31
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1G • Wind Turbine Tribology I .....	34
1J • Nanotribology I .....	36
1K • Metalworking Fluids I .....	36
1L • Nonferrous Metals I .....	37
1M • Fluid Film Bearings I .....	38

#### Technical Sessions (1:30 – 6 pm)

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4H • Materials Tribology III .....	76
4I • Engine and Drivetrain II .....	77
4J • Nanotribology IV .....	78
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5I • Surface Engineering I .....	104
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5K • Tribology of Biomaterials Biotribology & Materials Joint Session .....	108

#### Technical Sessions (1:30 – 6 pm)

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### THURSDAY, MAY 23

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## 2019 EDUCATION COURSES INDEX

*Rooms subject to change.*

### SUNDAY, MAY 19

#### Education Courses (All day 8 am to 5 pm)

● ABMA Bearings.....	18
● Advanced Lubrication 301: Advanced Additives .....	18
● Advanced Tribology 310: Nanotribology.....	18
● Automobile Lubrication 201: Diesel .....	19
● Biolubricants and Biofuels .....	19
● Hydraulics 201: Hydraulic Fluids and System Overview .....	19
● Metalworking Fluids 115: Metal Removal Fluids .....	20
● Synthetic Lubricants 203: Non-Petroleum Fluids and Their Uses .....	20

### WEDNESDAY, MAY 22

#### Education Courses (All day 8 am to 5 pm)

● Advanced Lubrication 302: Advanced Lubrication Regimes .....	20
● Basic Lubrication 103.....	20
● Metalworking Fluids 130: Metal Treating, Cleaning and Protecting Fluids.....	22
● Synthetic Lubricants 204: Basestock Selection and Applications.....	22

## 2019 STLE BUSINESS MEETINGS

*Technical Committees and Industry Councils*

### MONDAY, MAY 20

Cumberland 4  
**Metalworking Fluids**  
(5 – 5:30 pm)

Cumberland 5  
**Nonferrous Metals**  
(5:30 – 6 pm)

Music Row 3  
**Wind Turbine Tribology**  
(5:30 – 6 pm)

Cumberland 6  
**Fluid Film Bearings**  
(6 – 6:30 pm)

Music Row 1  
**Gears**  
(6 – 6:30 pm)

### TUESDAY, MAY 21

Cumberland 4 –  
**Environmentally Friendly  
Fluids**  
(5 – 5:30 pm)

Music Row 3  
**Tribotesting**  
(5:30 – 6 pm)

Music Row 1  
**Wear**  
(5:30 – 6 pm)

Cumberland 6  
**Materials Tribology**  
(6 – 6:30 pm)

### WEDNESDAY, MAY 22

Music Row 1  
**Biotribology**  
(4:30 – 5 pm)

Cumberland 1/2  
**Engine and Drivetrain**  
(4:30 – 5 pm)

Music Row 2  
**Synthetics and Hydraulics**  
(4:30 – 5 pm)

Cumberland 6  
**Condition Monitoring**  
(5 – 5:30 pm)

Cumberland 4  
**Surface Engineering**  
(5 – 5:30 pm)

Cumberland 5  
**Lubrication Fundamentals**  
(5:30 – 6 pm)

Cumberland 3  
**Nanotribology**  
(5:30 – 6 pm)

Legends F  
**Rolling Element Bearings**  
(6:30 – 7 pm)

### THURSDAY, MAY 23

Music Row 5  
**Power Generation**  
(4 – 4:30 pm)

Cumberland 1  
**Grease**  
(4:30 – 5 pm)

Cumberland 3  
**Contact Mechanics**  
(5 – 5:30 pm)

Music Row 4  
**Seals**  
(5 – 5:30 pm)

**KEYNOTE ADDRESS**  
Opening General Session

**MONDAY, MAY 20**  
10:30 am – Noon  
Legends Ballroom

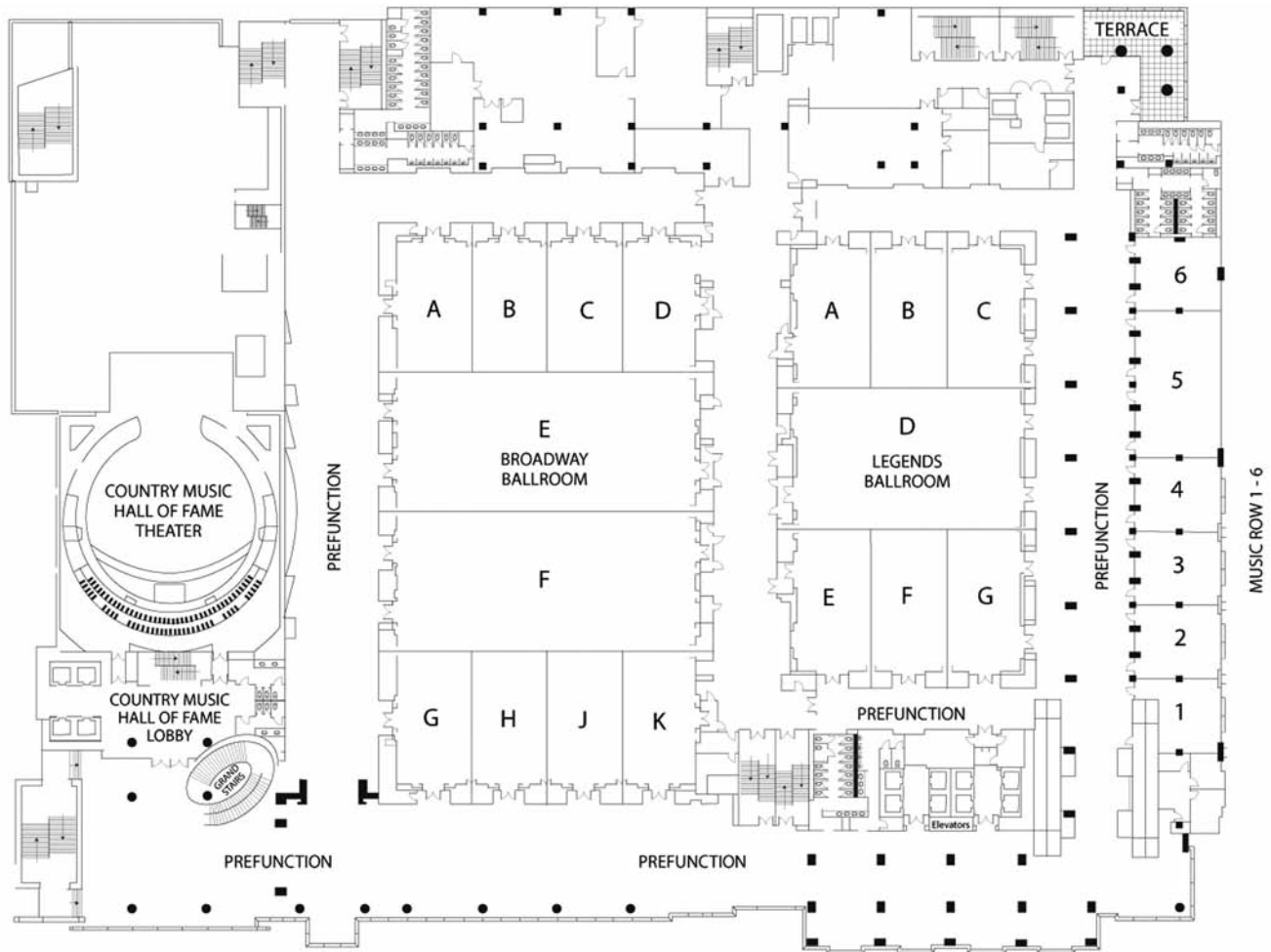
*Racing into the Future*

**Impact of Tribology on Vehicle Electrification**

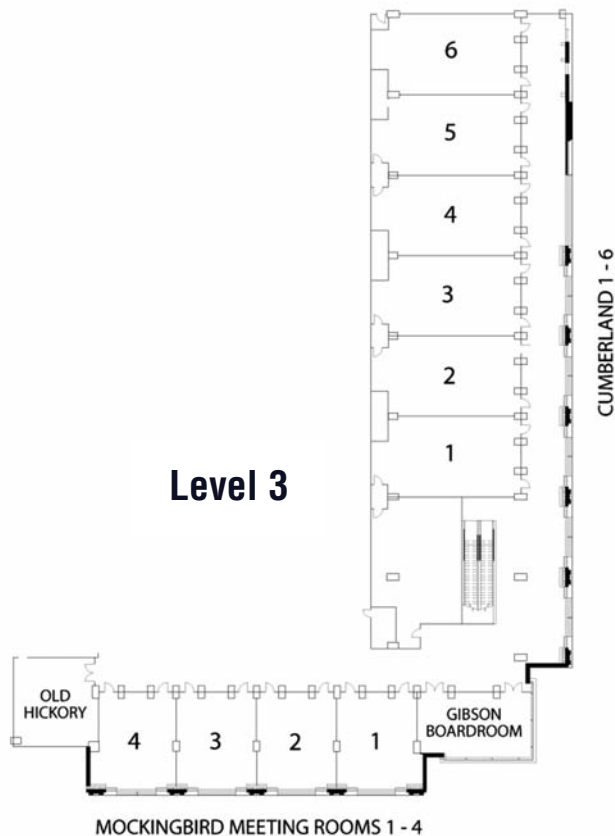
Presented by Jeff Hemphill, Chief Technical Officer, Americas, Schaeffler, Group USA Inc.



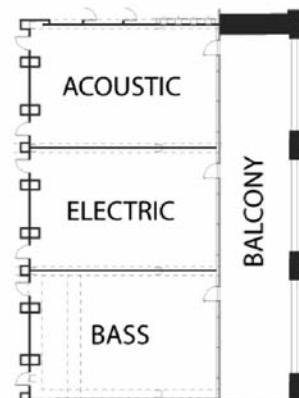
# Omni Nashville Hotel | Level 2



## Level 3



## Level 4





## 2019 STLE ANNUAL MEETING EXHIBITORS

*The exhibition is located in the Omni Nashville Hotel Broadway Ballroom.*

COMPANY NAME	BOOTH #	COMPANY NAME	BOOTH #	COMPANY NAME	BOOTH #
Abitec Corp.....	412	Ergon, Inc.....	505/507	Polytec, Inc. ....	209
Acme-Hardesty Co.....	405/407	Evonik Oil Additives USA, Inc. ....	301	Qualice, LLC .....	512
Adeka Corp.....	110	Exakt Technologies .....	117	Rtec-Instruments, Inc. ....	601
Advanced Chemical Concepts.....	510	ExxonMobil Chemical Co.....	401	Sasol Performance Chemicals .....	516/518
Afton Chemical Corp.....	509	FedChem, LLC .....	413	Savant Labs & Institute of Materials .....	316
American Petroleum Institute .....	206	Focus Chemical .....	417	SCP Science .....	9
Ametek Spectro Scientific.....	710	Formulation, Inc. ....	10	Sea-Land Chemical Co.....	305/307
ANGUS Chemical Co. ....	309	Functional Products, Inc.....	611	SEQENS/PCAS .....	119
Anhui Trust Chem Co., Ltd.....	709	GEO Specialty Chemicals.....	606	Shanghai Intex Exhibition Co.....	5
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AquaPhoenix Scientific Inc. ....	208	Huntsman, LLC .....	614	Shell.....	6
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*The above exhibitors are displaying the lubricant industry's latest products, services and technologies at the 2019 STLE Annual Meeting & Exhibition. This list is complete through April 23, 2019.*



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104	Wego Chemical Group	117	Exakt Tech.	216	Lazar Scientific Inc.	215	Shanghai NACO Lubrication	316	Savant / Instr. of Materials	315	Croda Inc.	412	ABITEC Corp.	417	Focus Chemical	514	SONGWON Industrial Group	615	KH Neochem Americas	711	Auburn University	709	Anhui Trust Chem Co.	705	Ele Corp.	703	Nouryon		
108	ADEKA Corp.	113	Teknor Apex Company	214	BYK USA Inc.	213	Vantage	314	Wincom Inc.	313	Napoleon Engineering Services	410/410	ABITEC Corp.	413	Pilot Chemical Company	512	FedChem	612	Huntsman	710	AMETEK Spectro Scientific	708	Turbo-machinery Laboratory	607/609	PCS Instr.	605	Vanderbilt Chemicals, LLC	601	Rtec Instruments, Inc.
102	Zygo Corp.	109	Clark Testing	212	ChemCeed	209	Polytec, Inc.	312	Metall-Chemie GmbH	309	Eastman	408/410	The Lubrizol Corp.	409	MUNZING	510	Advanced Chemical Concepts	606	BASF	704/706	Functional Products, Inc.	607/609	PCS Instr.	605	Vanderbilt Chemicals, LLC	601	Rtec Instruments, Inc.		
107	LGC Standards / VHG	111	United Soybean Board	210	Oil Filtration Systems	207	Industrial Quimica Lasem	310	Cannon Instr. Company	305/307	ANGUS Chemical Co.	404/406	King Industries, Inc.	405/407	Acme-Hardesty Co.	504/506	Italmatch Chemicals	604	Dexsil Corp.	708	Turbo-machinery Laboratory	607/609	PCS Instr.	605	Vanderbilt Chemicals, LLC	601	Rtec Instruments, Inc.		
106	Phoenix Tribology Ltd.	105	Microtap USA, Inc.	204	Werner G. Smith, Inc.	205	Zschimmer & Schwarz	308	Kao Chemicals GmbH	305/307	Sea-Land Chemical Company	404/406	King Industries, Inc.	405/407	Acme-Hardesty Co.	504/506	Italmatch Chemicals	604	Dexsil Corp.	708	Turbo-machinery Laboratory	607/609	PCS Instr.	605	Vanderbilt Chemicals, LLC	601	Rtec Instruments, Inc.		
103	Wego Chemical Group	101	Bruker	201	Ducom Instruments	301	Evonik Oil Additives USA, Inc.	401	ExxonMobil Chemical Company	501	The Dow Chemical Company	601	Rtec Instruments, Inc.	705	Ele Corp.	703	Nouryon	711	Auburn University	709	Anhui Trust Chem Co.	705	Ele Corp.	703	Nouryon	717	NSF International	715	Baron USA, LLC
102	Zygo Corp.	101	Bruker	201	Ducom Instruments	301	Evonik Oil Additives USA, Inc.	401	ExxonMobil Chemical Company	501	The Dow Chemical Company	601	Rtec Instruments, Inc.	705	Ele Corp.	703	Nouryon	711	Auburn University	709	Anhui Trust Chem Co.	705	Ele Corp.	703	Nouryon	717	NSF International	715	Baron USA, LLC
101	Bruker	201	Ducom Instruments	301	Evonik Oil Additives USA, Inc.	401	ExxonMobil Chemical Company	501	The Dow Chemical Company	601	Rtec Instruments, Inc.	705	Ele Corp.	703	Nouryon	711	Auburn University	709	Anhui Trust Chem Co.	705	Ele Corp.	703	Nouryon	717	NSF International	715	Baron USA, LLC		
100	Bruker	200	Ducom Instruments	300	Evonik Oil Additives USA, Inc.	400	ExxonMobil Chemical Company	500	The Dow Chemical Company	600	Rtec Instruments, Inc.	700	Ele Corp.	702	Nouryon	710	Auburn University	708	Anhui Trust Chem Co.	704	Ele Corp.	702	Nouryon	716	NSF International	714	Baron USA, LLC		
99	Bruker	199	Ducom Instruments	299	Evonik Oil Additives USA, Inc.	399	ExxonMobil Chemical Company	499	The Dow Chemical Company	599	Rtec Instruments, Inc.	699	Ele Corp.	701	Nouryon	709	Auburn University	707	Anhui Trust Chem Co.	703	Ele Corp.	701	Nouryon	715	NSF International	713	Baron USA, LLC		
98	Bruker	198	Ducom Instruments	298	Evonik Oil Additives USA, Inc.	398	ExxonMobil Chemical Company	498	The Dow Chemical Company	598	Rtec Instruments, Inc.	698	Ele Corp.	700	Nouryon	708	Auburn University	706	Anhui Trust Chem Co.	702	Ele Corp.	700	Nouryon	714	NSF International	712	Baron USA, LLC		
97	Bruker	197	Ducom Instruments	297	Evonik Oil Additives USA, Inc.	397	ExxonMobil Chemical Company	497	The Dow Chemical Company	597	Rtec Instruments, Inc.	697	Ele Corp.	699	Nouryon	707	Auburn University	705	Anhui Trust Chem Co.	701	Ele Corp.	699	Nouryon	713	NSF International	711	Baron USA, LLC		
96	Bruker	196	Ducom Instruments	296	Evonik Oil Additives USA, Inc.	396	ExxonMobil Chemical Company	496	The Dow Chemical Company	596	Rtec Instruments, Inc.	696	Ele Corp.	698	Nouryon	706	Auburn University	704	Anhui Trust Chem Co.	700	Ele Corp.	698	Nouryon	712	NSF International	710	Baron USA, LLC		
95	Bruker	195	Ducom Instruments	295	Evonik Oil Additives USA, Inc.	395	ExxonMobil Chemical Company	495	The Dow Chemical Company	595	Rtec Instruments, Inc.	695	Ele Corp.	697	Nouryon	705	Auburn University	703	Anhui Trust Chem Co.	699	Ele Corp.	697	Nouryon	711	NSF International	709	Baron USA, LLC		
94	Bruker	194	Ducom Instruments	294	Evonik Oil Additives USA, Inc.	394	ExxonMobil Chemical Company	494	The Dow Chemical Company	594	Rtec Instruments, Inc.	694	Ele Corp.	696	Nouryon	704	Auburn University	702	Anhui Trust Chem Co.	698	Ele Corp.	696	Nouryon	710	NSF International	708	Baron USA, LLC		
93	Bruker	193	Ducom Instruments	293	Evonik Oil Additives USA, Inc.	393	ExxonMobil Chemical Company	493	The Dow Chemical Company	593	Rtec Instruments, Inc.	693	Ele Corp.	695	Nouryon	703	Auburn University	701	Anhui Trust Chem Co.	697	Ele Corp.	695	Nouryon	708	NSF International	706	Baron USA, LLC		
92	Bruker	192	Ducom Instruments	292	Evonik Oil Additives USA, Inc.	392	ExxonMobil Chemical Company	492	The Dow Chemical Company	592	Rtec Instruments, Inc.	692	Ele Corp.	694	Nouryon	702	Auburn University	700	Anhui Trust Chem Co.	696	Ele Corp.	694	Nouryon	707	NSF International	705	Baron USA, LLC		
91	Bruker	191	Ducom Instruments	291	Evonik Oil Additives USA, Inc.	391	ExxonMobil Chemical Company	491	The Dow Chemical Company	591	Rtec Instruments, Inc.	691	Ele Corp.	693	Nouryon	701	Auburn University	699	Anhui Trust Chem Co.	695	Ele Corp.	693	Nouryon	706	NSF International	704	Baron USA, LLC		
90	Bruker	190	Ducom Instruments	290	Evonik Oil Additives USA, Inc.	390	ExxonMobil Chemical Company	490	The Dow Chemical Company	590	Rtec Instruments, Inc.	690	Ele Corp.	692	Nouryon	700	Auburn University	698	Anhui Trust Chem Co.	694	Ele Corp.	692	Nouryon	705	NSF International	703	Baron USA, LLC		
89	Bruker	189	Ducom Instruments	289	Evonik Oil Additives USA, Inc.	389	ExxonMobil Chemical Company	489	The Dow Chemical Company	589	Rtec Instruments, Inc.	689	Ele Corp.	691	Nouryon	699	Auburn University	697	Anhui Trust Chem Co.	693	Ele Corp.	691	Nouryon	704	NSF International	702	Baron USA, LLC		
88	Bruker	188	Ducom Instruments	288	Evonik Oil Additives USA, Inc.	388	ExxonMobil Chemical Company	488	The Dow Chemical Company	588	Rtec Instruments, Inc.	688	Ele Corp.	690	Nouryon	698	Auburn University	696	Anhui Trust Chem Co.	692	Ele Corp.	690	Nouryon	703	NSF International	701	Baron USA, LLC		
87	Bruker	187	Ducom Instruments	287	Evonik Oil Additives USA, Inc.	387	ExxonMobil Chemical Company	487	The Dow Chemical Company	587	Rtec Instruments, Inc.	687	Ele Corp.	689	Nouryon	697	Auburn University	695	Anhui Trust Chem Co.	691	Ele Corp.	689	Nouryon	702	NSF International	700	Baron USA, LLC		
86	Bruker	186	Ducom Instruments	286	Evonik Oil Additives USA, Inc.	386	ExxonMobil Chemical Company	486	The Dow Chemical Company	586	Rtec Instruments, Inc.	686	Ele Corp.	688	Nouryon	696	Auburn University	694	Anhui Trust Chem Co.	690	Ele Corp.	688	Nouryon	701	NSF International	699	Baron USA, LLC		
85	Bruker	185	Ducom Instruments	285	Evonik Oil Additives USA, Inc.	385	ExxonMobil Chemical Company	485	The Dow Chemical Company	585	Rtec Instruments, Inc.	685	Ele Corp.	687	Nouryon	695	Auburn University	693	Anhui Trust Chem Co.	689	Ele Corp.	687	Nouryon	700	NSF International	698	Baron USA, LLC		
84	Bruker	184	Ducom Instruments	284	Evonik Oil Additives USA, Inc.	384	ExxonMobil Chemical Company	484	The Dow Chemical Company	584	Rtec Instruments, Inc.	684	Ele Corp.	686	Nouryon	694	Auburn University	692	Anhui Trust Chem Co.	688	Ele Corp.	686	Nouryon	699	NSF International	697	Baron USA, LLC		
83	Bruker	183	Ducom Instruments	283	Evonik Oil Additives USA, Inc.	383	ExxonMobil Chemical Company	483	The Dow Chemical Company	583	Rtec Instruments, Inc.	683	Ele Corp.	685	Nouryon	693	Auburn University	691	Anhui Trust Chem Co.	687	Ele Corp.	685	Nouryon	698	NSF International	696	Baron USA, LLC		
82	Bruker	182	Ducom Instruments	282	Evonik Oil Additives USA, Inc.	382	ExxonMobil Chemical Company	482	The Dow Chemical Company	582	Rtec Instruments, Inc.	682	Ele Corp.	684	Nouryon	692	Auburn University	690	Anhui Trust Chem Co.	686	Ele Corp.	684	Nouryon	697	NSF International	695	Baron USA, LLC		
81	Bruker	181	Ducom Instruments	281	Evonik Oil Additives USA, Inc.	381	ExxonMobil Chemical Company	481	The Dow Chemical Company	581	Rtec Instruments, Inc.	681	Ele Corp.	683	Nouryon	691	Auburn University	689	Anhui Trust Chem Co.	685	Ele Corp.	683	Nouryon	696	NSF International	694	Baron USA, LLC		
80	Bruker	180	Ducom Instruments	280	Evonik Oil Additives USA, Inc.	380	ExxonMobil Chemical Company	480	The Dow Chemical Company	580	Rtec Instruments, Inc.	680	Ele Corp.	682	Nouryon	690	Auburn University	688	Anhui Trust Chem Co.	684	Ele Corp.	682	Nouryon	695	NSF International	693	Baron USA, LLC		
79	Bruker	179	Ducom Instruments	279	Evonik Oil Additives USA, Inc.	379	ExxonMobil Chemical Company	479	The Dow Chemical Company	579	Rtec Instruments, Inc.	679	Ele Corp.	681	Nouryon	689	Auburn University	687	Anhui Trust Chem Co.	683	Ele Corp.	681	Nouryon	694	NSF International	692	Baron USA, LLC		
78	Bruker	178	Ducom Instruments	278	Evonik Oil Additives USA, Inc.	378	ExxonMobil Chemical Company	478	The Dow Chemical Company	578	Rtec Instruments, Inc.	678	Ele Corp.	680	Nouryon	688	Auburn University	686	Anhui Trust Chem Co.	682	Ele Corp.	680	Nouryon	693	NSF International	691	Baron USA, LLC		
77	Bruker	177	Ducom Instruments	277	Evonik Oil Additives USA, Inc.	377	ExxonMobil Chemical Company	477	The Dow Chemical Company	577	Rtec Instruments, Inc.	677	Ele Corp.	679	Nouryon	687	Auburn University	685	Anhui Trust Chem Co.	681	Ele Corp.	679	Nouryon	692	NSF International	690	Baron USA, LLC		
76	Bruker	176	Ducom Instruments	276	Evonik Oil Additives USA, Inc.	376	ExxonMobil Chemical Company	476	The Dow Chemical Company	576	Rtec Instruments, Inc.	676	Ele Corp.	678	Nouryon	686	Auburn University	684	Anhui Trust Chem Co.	680	Ele Corp.	678	Nouryon	691	NSF International	689	Baron USA, LLC		
75	Bruker	175	Ducom Instruments	275	Evonik Oil Additives USA, Inc.	375	ExxonMobil Chemical Company	475	The Dow Chemical Company	575	Rtec Instruments, Inc.	675	Ele Corp.	677	Nouryon	685	Auburn University	683	Anhui Trust Chem Co.	679	Ele Corp.	677	Nouryon	690	NSF International	688	Baron USA, LLC		
74	Bruker	174	Ducom Instruments	274	Evonik Oil Additives USA, Inc.	374	ExxonMobil Chemical Company	474	The Dow Chemical Company	574	Rtec Instruments, Inc.	674	Ele Corp.	676	Nouryon	684	Auburn University	682	Anhui Trust Chem Co.	678	Ele Corp.	676	Nouryon	689	NSF International	687	Baron USA, LLC		
73	Bruker	173	Ducom Instruments	273	Evonik Oil Additives USA, Inc.	373	ExxonMobil Chemical Company	473	The Dow Chemical Company	573	Rtec Instruments, Inc.	673	Ele Corp.	675	Nouryon	683	Auburn University	681	Anhui Trust Chem Co.	677	Ele Corp.	675	Nouryon	688	NSF International	686	Baron USA, LLC		
72	Bruker	172	Ducom Instruments	272	Evonik Oil Additives USA, Inc.	372	ExxonMobil Chemical Company	472	The Dow Chemical Company	572	Rtec Instruments, Inc.	672	Ele Corp.	674	Nouryon	682	Auburn University	680	Anhui Trust Chem Co.	676	Ele Corp.	674	Nouryon	687	NSF International	685	Baron USA, LLC		
71	Bruker	171	Ducom Instruments	271	Evonik Oil Additives USA, Inc.	371	ExxonMobil Chemical Company	471	The Dow Chemical Company	571	Rtec Instruments, Inc.	671	Ele Corp.	673	Nouryon	681	Auburn University	679	Anhui Trust Chem Co.	675	Ele Corp.	673	Nouryon	686	NSF International	684	Baron USA, LLC		
70	Bruker	170	Ducom Instruments	270	Evonik Oil Additives USA, Inc.	370	ExxonMobil Chemical Company	470	The Dow Chemical Company	570	Rtec Instruments, Inc.	670	Ele Corp.	672	Nouryon	680	Auburn University	678	Anhui Trust Chem Co.	674	Ele Corp.	672	Nouryon	685	NSF International	683	Baron USA, LLC		
69	Bruker	169	Ducom Instruments	269	Evonik Oil Additives USA, Inc.	369	ExxonMobil Chemical Company	469	The Dow Chemical Company	569	Rtec Instruments, Inc.	669	Ele Corp.	671	Nouryon	679	Auburn University	677	Anhui Trust Chem Co.	673	Ele Corp.	671	Nouryon	684	NSF International	682	Baron USA, LLC		
68	Bruker	168	Ducom Instruments	268	Evonik Oil Additives USA, Inc.	368	ExxonMobil Chemical Company	468	The Dow Chemical Company	568	Rtec Instruments, Inc.	668	Ele Corp.	670	Nouryon	678	Auburn University	676	Anhui Trust Chem Co.	672	Ele Corp.	670	Nouryon	683	NSF International	681	Baron USA, LLC		
67	Bruker	167	Ducom Instruments	267	Evonik Oil Additives USA, Inc.	367	ExxonMobil Chemical Company	467	The Dow Chemical Company	567	Rtec Instruments, Inc.	667	Ele Corp.	669	Nouryon	677	Auburn University	675	Anhui Trust Chem Co.	671	Ele Corp.	669	Nouryon	682	NSF International	680	Baron USA, LLC		
66	Bruker	166	Ducom Instruments	266	Evonik Oil Additives USA, Inc.	366	ExxonMobil Chemical Company	466	The Dow Chemical Company	566	Rtec Instruments, Inc.	666	Ele Corp.	668	Nouryon	676	Auburn University	674	Anhui Trust Chem Co.	670	Ele Corp.	668	Nouryon	681	NSF International	679	Baron USA, LLC		
65	Bruker	165	Ducom Instruments	265	Evonik Oil Additives USA, Inc.	365	ExxonMobil Chemical Company	465	The Dow Chemical Company	565	Rtec Instruments, Inc.	665	Ele Corp.	667	Nouryon	675	Auburn University	673	Anhui Trust Chem Co.	669	Ele Corp.	667	Nouryon	680	NSF International	678	Baron USA, LLC		
64	Bruker	164	Ducom Instruments	264	Evonik Oil Additives USA, Inc.	364	ExxonMobil Chemical Company	464	The Dow Chemical Company	564	Rtec Instruments, Inc.	664	Ele Corp.	666	Nouryon	674	Auburn University	672	Anhui Trust Chem Co.	668	Ele Corp.	666	Nouryon	679	NSF International	677	Baron USA, LLC		
63	Bruker	163	Ducom Instruments	263	Evonik Oil Additives USA, Inc.	363	ExxonMobil Chemical Company	463	The Dow Chemical Company	563	Rtec Instruments, Inc.	663	Ele Corp.	665	Nouryon	673	Auburn University	671	Anhui Trust Chem Co.	667	Ele Corp.	665	Nouryon	678	NSF International	676	Baron USA, LLC		
62	Bruker	162	Ducom Instruments	262	Evonik Oil Additives USA, Inc.	362	ExxonMobil Chemical Company	462	The Dow Chemical Company	562	Rtec Instruments, Inc.	662	Ele Corp.	664	Nouryon	672	Auburn University	670	Anhui Trust Chem Co.	666	Ele Corp.	664	Nouryon	677	NSF International	675	Baron USA, LLC		
61	Bruker	161	Ducom Instruments	261	Evonik Oil Additives USA, Inc.	361	ExxonMobil Chemical Company	461	The Dow Chemical Company	561	Rtec Instruments, Inc.	661	Ele Corp.	663	Nouryon	671	Auburn University	669	Anhui Trust Chem Co.	665	Ele Corp.	663	Nouryon	676	NSF International	674	Baron USA, LLC		
60	Bruker	160	Ducom Instruments	260	Evonik Oil Additives USA, Inc.	360	ExxonMobil Chemical Company	460	The Dow Chemical Company	560	Rtec Instruments, Inc.	660	Ele Corp.	662	Nouryon	670	Auburn University	668	Anhui Trust Chem Co.	664	Ele Corp.	662	Nouryon	675	NSF International	673	Baron USA, LLC		
59	Bruker	159	Ducom Instruments	259	Evonik Oil Additives USA, Inc.	359	ExxonMobil Chemical Company	459	The Dow Chemical Company	559	Rtec Instruments, Inc.	659	Ele Corp.	661	Nouryon	669	Auburn University	667	Anhui Trust Chem Co.	663	Ele Corp.	661	Nouryon	674	NSF International	672	Baron USA, LLC		
58	Bruker	158	Ducom Instruments	258																									

STLE wishes to thank the following sponsors for their generous support of the 74th STLE Annual Meeting & Exhibition, May 19-23, 2019, at the Omni Nashville Hotel in Nashville, Tenn. **This list is complete through April 23, 2019.** Please see signage in Nashville for the most up-to-date information. This information also appears in the Annual Meeting section of the STLE 365 App. **The Annual Meeting section of the app is sponsored by Palmer Holland/Focus Chemical** and contains the latest information and any alerts related to the trade show. Download the app from the App Store (Apple products) or The Play Store (Android products), or just **scan the QR code on page 13.**

## 2019 STLE ANNUAL MEETING SPONSORS

*The exhibition is located in the Omni Nashville Hotel Broadway Ballroom.*

### Palladium Plus: more than \$4,000

- Afton Chemical Corp. – Guestroom Key Cards
- ANGUS Chemical Co. – Registration Bags
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- Ergon, Inc. – Networking Reception
- Loadmaster Lubricants – Education Course Lunches
- Münzing – Badge Lanyards
- Nouryon – Refreshment Breaks/Water Stations
- Palmer Holland/Focus Chemical – Annual Meeting Mobile App
- Shell Global Solutions (US), Inc. – Directional Floor Signs
- The Lubrizol Corp. – WiFi Service

### Titanium Plus: more than \$3,000

- Evonik Oil Additives – Exhibitor Appreciation Hour Raffle
- Monson Companies—An Azelis Co. – Welcome Gift
- Pilot Chemical Co. – Relaxation/Recharging Lounge

### Titanium: \$3,000

- CRODA – Education Course Materials
- Daubert Chemical Co. – President's Luncheon
- Emery Oleochemicals – Networking Reception
- Vanderbilt Global Services – Networking Reception

### Platinum: \$2,000

- Sea-Land Chemical Co. – Networking Reception
- Zschimmer & Schwarz – Speakers Breakfast Series

### Gold: \$1,000

- The American Society of Mechanical Engineers (ASME) – Networking Reception
- ExxonMobil Chemical – Networking Reception
- Huntsman – Networking Reception
- Ideas, Inc. – Networking Reception
- Industrial Oils Unlimited, LLC – Networking Reception
- Micros Lubrication Technology, Ltd. Networking Reception
- Nouryon – Networking Reception
- Novitas Chem Solutions, LLC – Networking Reception
- Nye Lubricants Inc. – Networking Reception
- Petro-Canada Lubricants – Networking Reception
- Southwest Research Institute – Networking Reception
- STLE Chicago Section – Networking Reception
- STLE Hamilton Section – Networking Reception
- STLE Philadelphia Section – Networking Reception
- The Timken Co. – Networking Reception

### Silver: \$750

- ChemCeed LLC – Networking Reception
- King Industries, Inc. – Networking Reception

### Bronze: \$500

- Acme-Hardesty Co. – Networking Reception
- American Refining Group – Networking Reception
- Axel Royal LLC – Networking Reception
- Compass Instruments – Networking Reception
- Falex Corp. – Networking Reception
- Hall Technologies, Inc. – Networking Reception
- ICL-IP – Networking Reception
- INEOS Oligomers – Networking Reception
- Lockhart Chemical Co. – Networking Reception
- STLE Detroit Section – Networking Reception
- STLE Houston Section – Networking Reception
- Temix Oleo – Networking Reception
- TH Hilson – Networking Reception



# The STLE Annual Meeting in the STLE 365 App.



74th STLE Annual Meeting & Exhibition  
May 19-23, 2019  
Omni Nashville Hotel  
Nashville, Tennessee (USA)

STLE's Annual Meeting offers so much programming that keeping track of what's happening when and where can be a challenge. The STLE 365 App lets you plan your itinerary, schedule appointments and stay on top of fast-breaking meeting updates every minute of the day. Download the 365 app—and don't miss a thing!

The Annual Meeting section of STLE's 365 app (under the Event Apps section) lets you track, schedule and connect with:

- Nearly 500 technical session abstracts—push a button and it's on your itinerary!
- Paper presenters—easily find your favorite authors
- 12 lubrication-specific education courses
- More than 100 exhibitors at the trade show
- Special events and networking opportunities
- Floor plans of the Omni Nashville Hotel and exhibition
- 1,600 international attendees
- Meeting sponsors
- Local dining options
- Meeting updates—stay on top of late-breaking news.



## *Download the app— and don't miss a thing!*

Download the app from The App Store (Apple products) or The Play Store (Android products). Log in using your STLE member ID and password.

Once in the 365 app, go to Event Apps to find STLE's 74th Annual Meeting & Exhibition.

For additional questions about the app, please contact Bruce Murgueitio at [bmurgueitio@stle.org](mailto:bmurgueitio@stle.org).



### **STLE 365 App**

Annual Meeting section sponsored by  
**Palmer Holland/Focus Chemical.**



## GENERAL INFORMATION AND POLICIES

*The exhibition is located in the Omni Nashville Hotel Broadway Ballroom.*

### Exhibition Hours

- **Monday, May 20** (Noon – 5 pm)  
**Exhibitor Appreciation Hour** (3 – 4 pm)  
Evonik Raffle (3:30 pm) – Must be present to win.
- **Tuesday, May 21** (9:30 am – Noon) & (2 – 5:30 pm)  
*Closed for Presidents Luncheon* (Noon – 2 pm)  
**Exhibitor Appreciation Hour** (3 – 4 pm)  
Evonik Raffle (3:30 pm) – Must be present to win.
- **Wednesday, May 22** (9:30 am – Noon)

### Registration Information

Attendees may register beginning on Saturday, May, 19, from Noon to 6 pm in the Second Level Foyer of the Omni Nashville Hotel. The STLE registration desk is open daily thereafter through Thursday beginning at 7 am.

Registration entitles you to attend the technical sessions, trade show (Monday through Wednesday), Networking Reception on Monday evening, President's Luncheon on Tuesday afternoon and most other sanctioned annual meeting events.

President's Luncheon guest tickets are \$50 (free to STLE Corporate Members (**two tickets**) and students) and can be purchased at the STLE registration desk in the Second Level Foyer of the Omni.

Attendance at business meetings of technical committees and industry councils is open to anyone who is registered for the meeting. See condensed schedule (pg. 8) for time and location of individual technical committee and industry council meetings.

### Registration Hours

- **Saturday, May 18** (Noon – 6 pm)
- **Sunday, May 19** (7 am – 6 pm)
- **Monday, May 20** (7 am – 6 pm)
- **Tuesday, May 21** (7 am – 6 pm)
- **Wednesday, May 22** (7 am – 6 pm)
- **Thursday, May 23** (7 am – Noon)



### Annual Meeting & Education Course Policies

- All attendees must register.
- All attendees receive a badge with their registration materials. The badge must be worn at all times and is required for admittance to any technical session, education course and the trade show.
- Badges may not be exchanged. Attendees who loan their badges to others will have their badges confiscated and their annual meeting privileges rescinded.
- Annual Meeting registration includes admittance to the trade show, technical sessions, Commercial Marketing Forum and all social events, including the Monday evening Networking Reception and Tuesday afternoon President's Luncheon.
- Distributing handouts at technical sessions is not permitted. Handouts will be given to education course attendees.
- Disseminating material or conducting business in the exhibit hall is not permitted if you are not an official exhibitor.

### Recording Policy

Audio or video recording is not permitted in any of the annual meeting technical sessions or Commercial Marketing Forum presentations. Audio recording is permitted in the education courses with advance permission of the instructor. No video of any kind is permitted.

### Abstracts/Presentations Policy

In an effort to provide attendees with the opportunity of not missing a presentation, STLE has encouraged speakers/presenters to submit an optional 2-3 page extended abstract or share digital copies of their presentation slides. Available abstracts/presentations will be posted at [www.stle.org/annualmeeting](http://www.stle.org/annualmeeting) during and after the meeting, as speakers allow permission to STLE to post their abstracts/presentations online.

### Photo Policy

STLE's official photographer will take photos of select technical sessions, Commercial Marketing Forum presentations, social events and the trade show on Monday and Tuesday. These photos will be used in print materials promoting the 2020 STLE Annual Meeting & Exhibition in Chicago, Illinois (USA). If you do not wish to have your photograph taken and published, please step out of the photo frame or notify the photographer afterwards if your photo has been taken so the image can be deleted.





### STLE 365 App (Available for Apple or Android products)

Program updates will be posted daily in the Annual Meeting section of the **STLE 365 App** (under the Events Apps section).  
The STLE 365 App can be downloaded for free at [www.tripbuilder.com/apps/stle365](http://www.tripbuilder.com/apps/stle365).

### Cellular Phone Policy

In order to not disturb speakers or fellow attendees, please keep cellular telephones on vibrate and leave the room to talk.

### Dress Code

Business casual dress is appropriate for STLE events at the annual meeting. Technical session and education course speakers often choose attire that is more formal on the day of their presentations.

### Harassment Policy

STLE is committed to providing an atmosphere that encourages the free expression and exchange of scientific ideas. As part of that commitment, STLE is dedicated to promoting a safe and welcoming environment for all participants attending the STLE Annual Meeting & Exhibition. All participants are expected to abide by this policy in all venues at the STLE Annual Meeting, including ancillary events and official and unofficial social gatherings. Harassment of any kind is strictly prohibited, and the Society will not tolerate acts in violation of this policy. Any individual who believes that he or she has been the subject of, or has witnessed, harassment should immediately report the incident to STLE staff. All reports are confidential. A copy of the full policy is available at [www.stle.org](http://www.stle.org).

### Future Industry Meeting Dates

- **2019 STLE Tribology Frontiers Conference**  
The Drake Hotel Chicago  
**October 20-23, 2019**  
Chicago, Illinois (USA)
- **75th STLE Annual Meeting & Exhibition**  
Hyatt Regency Chicago  
**May 3-7, 2020**  
Chicago, Illinois (USA)
- **76th STLE Annual Meeting & Exhibition**  
Hyatt New Orleans  
**May 16-20, 2021**  
New Orleans, Louisiana (USA)
- **7th World Tribology Congress**  
**September 5-10, 2021**  
Lyon, France
- **77th STLE Annual Meeting & Exhibition**  
Walt Disney World Swan & Dolphin  
**May 15-19, 2022**  
Orlando, Florida (USA)



### Get Social with Us!

Stay up to date on the latest annual meeting announcements and connect with fellow attendees using the hashtag **#STLE2019** on your favorite social media sites.

Twitter | [@STLE\\_Tribology](https://twitter.com/STLE_Tribology)

Facebook | [Facebook.com/STLE](https://www.facebook.com/STLE)

Instagram | [@STLE\\_Tribology](https://www.instagram.com/STLE_Tribology)





## ANNUAL MEETING SPECIAL EVENTS

*All annual meeting events are in the Omni Nashville Hotel (unless noted).*



### STUDENT NETWORKING EVENT

• Sunday, May 19

**Redneck Riviera (Downtown Nashville) | Ticket Required**

This year's Student Networking Event is 6:30-8 pm at Redneck Riviera (a short walking distance from the Omni Nashville Hotel). Come join other students for an evening of networking and great food.

**This event is for students only, and space is limited!**

### NETWORKING RECEPTION

• Monday, May 20

**6:30 – 8 pm | Legends Ballroom**

This is the annual meeting's central networking event and a way for you to reconnect with old friends while making new ones. Since people come to STLE's Annual Meeting & Exhibition from around the world, this truly is an international event. Relax, socialize and add to your list of professional contacts through this outstanding networking event.

### PRESIDENT'S LUNCHEON & BUSINESS MEETING

• Tuesday, May 21

**Noon – 2 pm | Legends Ballroom | Ticket Required**



**Greg Croce**



**Mike Duncan**

The annual meeting's major business function draws virtually all attendees for a two-hour event honoring STLE's incoming and outgoing presidents, award winners and top volunteers. Come honor 2018-2019 President Greg Croce with Chevron Products Company

and 2019-2020 President Mike Duncan with Daubert Chemical Company Inc. **Tickets to the luncheon are included with annual meeting registration and free to STLE Corporate Member representatives (two tickets) and students.** Additional tickets may be purchased for \$50 per person at the STLE Registration Desk in the Second Level Foyer.

### OPENING GENERAL SESSION

• Monday, May 20

**10:30 am – Noon | Legends Ballroom**



STLE honors many of its most distinguished volunteers and achievers during the Monday General Session program. You'll also hear a presentation from Jeff Hemphill, Chief Technical Officer, Americas, with Schaeffler USA Inc., titled

**"Racing into the Future – Impact of Tribology on Vehicle Electrification."**



## KEYNOTE ADDRESS

*Opening General Session*

**Monday, May 20 | 10:30 am – Noon ••• Omni Nashville Hotel | Legends Ballroom**

### *Racing into the Future*

## Impact of Tribology on Vehicle Electrification

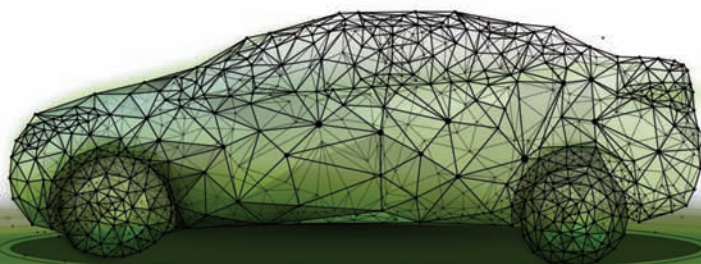
**Presented by Jeff Hemphill, Chief Technical Officer, Americas, Schaeffler Group USA Inc.**

Electric mobility is quickly moving from someday to today as electric cars are becoming common, and even electric scooters and bikes are entering the mobility scene. The benefits of electrification are many, including reduced emissions and maintenance, and improved performance. It is also unsettling to many engineers who have spent a career enabling conventional engines and transmissions. While the needs of electric powertrains are different, the fundamentals are the same. We have been learning about those needs on the racetrack, through Formula E, as well as in conventional automotive powertrains. This talk will share some of these lessons and point the way of future tribology efforts.



**Jeff Hemphill currently serves as Chief Technical Officer, Americas, for Schaeffler Group USA Inc., and is responsible for research and new product development for automotive transmission, engine, chassis, as well as industrial components and systems. His scope of responsibilities also encompasses IT and digitalization functions, which include facilitating the integration of digital capability into Schaeffler's new products and business models.**

**Jeff started his career at Schaeffler as a machinist and co-op student while earning a bachelor of science in mechanical engineering from The University of Akron. He also holds an executive certificate in strategy and innovation from MIT. He has over 30 years of experience in automotive and industrial product development, including manufacturing, product design, testing and vehicle development, and has 79 patents filed or issued.**







## EDUCATION COURSE DESCRIPTIONS & INSTRUCTORS

*All education courses are in the Omni Nashville Hotel.*

The 2019 STLE Annual Meeting & Exhibition features 12 lubrication-specific education courses offered on two days of the conference: **Sunday, May 19, and Wednesday, May 22.** The schedule is designed to give attendees more flexibility when planning their conference attendance. If you have not yet signed up for a course but would like to, please go to the STLE Registration Desk in the Second Level Foyer of the Omni Nashville Hotel to check on availability. Individuals will not be admitted to a course without registration.

**Note:** All courses are full day (**start at 8 am and end at 5 pm**) on Sunday and Wednesday, but please check the errata included in your registration bag to verify. Some course times might change slightly.

### SUNDAY, MAY 19

#### **ABMA Bearings and Their Lubrication**

*(Presented in cooperation with ABMA)*

• **Cumberland 4**

**Course Chair:** Les Miller, SKF/Kaydon, Auburn, IN

This course includes a basic overview of bearings, their selection, precision and mounting considerations, and lubrication-related influences, including a hands-on failure analysis session.

**Modules and Instructors include:**

**Bearing Types, Characteristics and Tolerances:** Rick Burgess, Kaydon Bearings, Norton Shores, MI

**Bearing Service Life – Modern Approach to Life Expectations:** Brian Dahmer, SKF USA Inc., Kulpville, PA

**Bearing Design for Dynamic Operating Conditions:** Hannes Grillenberger, Schaeffler Group, Herzogenaurach, Germany

**Lubrication Influence on Bearing Operating Characteristics:** Piet Lugt, SKF, Nieuwegein, Netherlands

**Lubrication Considerations for Linear Bearings:** Miles Riley, NSK Corp., Ann Arbor, MI

**Bearing Failures:** Dean Thayer, NSK Corp., Ann Arbor, MI

#### **Advanced Lubrication 301: Advanced Additives**

• **Cumberland 5/6**

**Course Chair:** Gabe Kirsch, The Lubrizol Corp., Wickliffe, OH

Advanced Lubrication 301 covers the molecular structures and chemistries of lubricant additive types. Additives examined will include antioxidants, rust inhibitors, detergents, dispersants, antiwear additives, extreme pressure additives, friction modifiers and rheology and viscosity modifiers.

**Modules and Instructors include:**

**Antioxidants & Rust Inhibitors:** Bridget Rakestraw, BASF Corp., Tarrytown, NY

**Detergents & Dispersants:** Anil Agiral, Chevron, Richmond, CA

**Antiwear, Extreme Pressure & Friction Modifiers:** Alex Mannion, BASF Corp., Tarrytown, NY

**Rheology & Viscosity Modifiers:** Sona Sivakova, The Lubrizol Corp., Wickliffe, OH

#### **Advanced Tribology 310: Nanotribology**

• **Mockingbird 1**

**Course Chairs:** Kalyan Mutyala, Argonne National Laboratory, Lemont, IL and Jonathan Yonghui Leong, Singapore University of Social Sciences, Singapore

This course will begin with an introduction to the topic of nanotribology. The course will then cover molecular dynamics, tribochemistry and nanomechanical characterization. The course day will conclude with a module covering nanoparticle additives.

**Modules and Instructors include:**

**Introduction to Nanotribology:** Bharat Bhushan, The Ohio State University, Columbus, OH

**Nanoparticles as Additives:** Fabrice Dassenoy, Ecole Centrale De Lyon, Ecully, France

**MD Simulations:** Justin Ye, Miami University, Oxford, OH

**Tribochemistry:** Seong Kim, Penn State University, University Park, PA

**Nanoscale Studies of Nanodiamond and Phosphate Ester Oil Additives and Blends:** Jacqueline Krim, North Carolina State University, Raleigh, NC



## Automobile Lubrication 201: Diesel

### ● Cumberland 1

**Course Chair: Peter Lee, Southwest Research Institute, San Antonio, TX**

Automobile Lubrication 201 provides a comprehensive overview of the various aspects of a typical diesel engine tribological system including modern fuels and lubricants. Lubrication and surface engineering principles will be applied to provide a unified approach to practical diesel powertrain systems.

#### Modules and Instructors include:

**Diesel Engine Hardware Overview:** Walter Isenberg, Caterpillar Inc., Frankfurt, IN

**Diesel Engine Oil Testing:** Jim McCord, Southwest Research Institute, San Antonio, TX

**Friction and Wear Testing of Diesel Engine Components:** George Plint, Phoenix Tribology Ltd., Whitway, United Kingdom

**Diesel Fuels:** Eric Kalberer, Shell, Detroit, MI

**Transmission Fluids:** Penny Do, Chevron, Richmond, CA

**Diesel Engine Oil Formulating:** William Anderson, Afton Chemical Corp., Richmond, VA

**Surface Texture Measurements/Analysis for Automotive Applications:** Sandip Basu, Bruker Nano Surfaces, Tucson, AZ

## Biolubricants and Biofuels

### ● Cumberland 2

**Course Chair: Girma Biresaw, USDA/ARS/NCAUR, Peoria, IL**

This course is an overview of current progress in the development and use of biofuels and biolubricants. The course elements will include an introduction to energy and alternative fuels; basic chemistry of biofuels and biolubes; general performance requirements; overviews of market progress; niche markets; and governmental and regulatory drivers. Products currently in various stages of commercialization will be discussed. Information on European, U.S. and OEM views will be included. The course will primarily focus on biolubricants but will include a general overview of alternative transportation fuels. Biofuel feedstocks, production and quality issues will be covered. An outstanding list of speakers with first-hand knowledge in these areas will teach the course.

#### Modules and Instructors include:

**Introduction to Biofuels and Biolubricants:** Girma Biresaw, USDA/ARS/NCAUR, Peoria, IL

## Chemistry 101 – Petroleum and Biobased Lubricants:

Paula Vettel, Novvi LLC, Emeryville, CA

**Chemistry 101 – Petroleum and Biobased Fuels:** Dan Garbark, Battelle Memorial Institute, Columbus, OH

**Growth of “Niche” Markets in the U.S.:** Larry Beaver, RSC Chemical Solutions, Indian Trail, NC

**USDA Biolubricant Programs:** Girma Biresaw, USDA/ARS/NCAUR, Peoria, IL

## Biofuels and Other Alternative Transportation Fuels:

Dan Garbark, Battelle Memorial Institute, Columbus, OH

## Biofuel & Biolubricant Developments and Markets in the EU:

Joseph Asadauskas, Institute of Chemistry, Vilnius, Lithuania

**Biodegradation, Regulations and Standards:** Neil Canter, Chemical Solutions, Willow Grove, PA

**General Performance Requirements of Lubricants:** Paula Vettel, Novvi, LLC, Emeryville, CA

**Biofuels Review Session:** Dan Garbark, Battelle Memorial Institute, Columbus, OH

**Biolubricants Review Session:** Girma Biresaw, USDA/ARS/NCAUR, Peoria, IL

## Hydraulics 201: Hydraulic Fluids and System Overview

### ● Cumberland 3

**Course Chair: Scott Howard, Hy-Pro Filtration, Virginia Beach, VA**

This course provides an overview of the basic mechanical components used in hydraulic fluid power transmission. The composition and performance of hydraulic fluids will be discussed. The course will also feature sections on maintenance and troubleshooting as they pertain to hydraulic systems and in-service fluid analysis.

#### Modules and Instructors include:

**Hydraulic Fluids & System Overview:** Hongmei Zhao, The Lubrizol Corp., Wickliffe, OH

**Hydraulic Fluids Composition & Performance Testing:** Nathan Knotts, Chevron, Richmond, CA

**How Friction Effects Hydraulic Components:** Scott Howard, Hy-Pro Filtration, Virginia Beach, VA

**Solid Contamination Control Filtration Terms & Concepts:** Scott Howard, Hy-Pro Filtration, Virginia Beach, VA

## Metalworking Fluids 115: Metal Removal Fluids

### • Legends B

**Course Chair:** Fred Passman, BCA, Inc., Princeton, NJ

Metalworking Fluids 115 covers the key concepts needed to better understand how metalworking fluids are prepared, used and maintained. Attendees will be informed about the reasons for using metal removal fluids and their functions. The chemistry of metal removal fluids, insight into the need to control microbial contamination and importance of adopting a health and safety program in a facility that machines metal are covered. Key topics include measures needed to understand and control metal removal fluid failure.

### Modules and Instructors include:

**Metal Removal Operations:** Gabe Kirsch, The Lubrizol Corp., Wickliffe, OH

**Metalworking Fluid Chemistry & Tankside Additives:** Neil Canter, Chemical Solutions, Willow Grove, PA

**Understanding and Controlling Metal Removal Failure:** John Burke, Houghton International Inc., Concord Township, OH

**Industrial Hygiene of Metalworking Fluids:** Fred Passman, BCA, Inc., Princeton, NJ

**Controlling Microbial Contamination in Metalworking Fluids:** Fred Passman, BCA, Inc., Princeton, NJ

**Metalworking Fluid Condition Monitoring:** Fred Passman, BCA, Inc., Princeton, NJ, Neil Canter, Chemical Solutions, Willow Grove, PA

**Fluid Condition Management:** Gabe Kirsch, The Lubrizol Corp., Wickliffe, OH

## Synthetic Lubricants 203: Non-Petroleum Fluids and Their Uses

### • Legends C

**Course Chair:** Vasu Bala, Tiarco Chemical, Dalton, GA

This course is designed primarily for formulators and users of lubricating materials. Synthetic Lubricants 203 provides an overview of non-petroleum-based lubricants, their comparison to each other and to petroleum oil. Each section covers the chemistry, strength and weaknesses of each material and basic application.

### Modules and Instructors include:

**Introduction to Synthetic Fluids:** Dennis Bachelder, American Petroleum Institute, Washington, DC

**Esters:** Gene Zehler, BASF Corp., Cincinnati, OH

**Polyglycols:** Martin Greaves, Dow Europe GmbH, Horgen, Switzerland

**Silicones:** Glenn Lutz, Dow Corning Corp., Midland, MI

**Polyalphaolefins:** Edgar Ortega, Chevron Phillips Chemical Co., The Woodlands, TX

**Alkylated Aromatics:** Kyle Lewis, ExxonMobil Chemical Co., Baytown, TX

**Phosphate Esters:** Salvatore Rea, LANXESS Corp., Pittsburgh, PA

## WEDNESDAY, MAY 22

## Advanced Lubrication 302: Advanced Lubrication Regimes

### • Legends A/B

**Course Chair:** Babak Lotfizadehdehkordi, ExxonMobil, Baytown, TX

Advanced Lubrication 302 goes more in-depth on lubrication regimes, wear and wear mechanisms, as well as lubricant failure analysis. This course includes a series of lubricant failure analysis case studies on automotive engines, gears and bearings.

### Modules and Instructors include:

**Lubrication Regimes:** Brendan Miller, Chevron Oronite Co., LLC, Richmond, CA

**Wear & Wear Mechanisms:** Ramoun Mourhatch, Chevron Oronite Co., LLC, Richmond, CA

**Lubricant Failure:** Jeffrey Guevremont, American Refining Group, Inc., Bradford, PA

**Failure Analysis – Gears:** Larry Ludwig, Schaeffer Manufacturing Co., St. Louis, MO

**Failure Analysis – Automotive Engines:** Hamed Ghaednia and Arup Gangopadhyay, Ford Motor Co., Dearborn, MI

**Failure Analysis – Bearings:** Vasilios Bakolas, Schaeffler Technologies AG & Co. KG, Schweinfurt, Germany

## Basic Lubrication 103

### • Legends C

**Course Chair:** Dan Holdmeyer, Chevron Lubricants, Louisville, KY

Basic Lubrication 103 is designed primarily for the person entering the lubrication field who needs a broad introduction to lubricants, lubricant building blocks, and lubricating materials. This course is also for persons not directly involved, but who need a broad overview of lubricants and basic lubricating components. This course does not require the course taker to have a formal scientific degree or background, although many technical terms and concepts are covered. Experienced people attend the course to be kept up to date on the latest developments, especially in those areas not directly related to their job function or area of expertise. Thus, Basic Lubrication 103 is usually attended by a broad cross-section of people such as technical, technical service, sales, marketing, manufacturing, maintenance and management, who in some way are involved in the industry. The course will focus on the fundamentals of lubrication associated with fluid film lubrication and grease as it applies to basic lubricated components such as gears and bearings. Also, the course will review some basics around base stocks, synthetic lubricants and lab testing.

### Modules and Instructors include:

**Lubrication Fundamentals:** Dan Holdmeyer, Chevron Lubricants, Louisville, KY

**Base Oil Fundamentals:** Yvette Trzcinski, Petro-Canada Lubricants, Inc., Waukesha, WI

**Additives:** Chris Schmid, The Lubrizol Corp., Wickliffe, OH





# Delivering Innovations **for a Sustainable Future**

## Introducing BT75 Biosynthetic™ Base Oil

BT75 is a high viscosity renewable base oil that offers exceptional technical performance and environmental benefits.

- ◇ High Biodegradability
- ◇ Non-Bioaccumulative
- ◇ Low Toxicity
- ◇ High Bio-content
- ◇ Excellent Hydrolytic Stability
- ◇ High Oxidative Stability
- ◇ Low Volatility
- ◇ High Viscosity Index
- ◇ Natural Detergency
- ◇ Longer Lasting
- ◇ Less Maintenance

## Course Schedule | Wednesday, May 22

**Synthetics:** Ken Hope, Chevron Phillips Chemical Co.,  
The Woodlands, TX

**Grease Fundamentals:** David Turner, CITO Petroleum Corp.,  
Houston, TX

**Lubricant Testing Methods:** Michael Holloway, ALS Services USA,  
Corp., Highland Village, TX

### Metalworking Fluids 130: Metal Treating, Cleaning and Protecting Fluids

- **Legends E**

**Course Chair:** Patrick Brutto, Faith-Full MWF Consulting,  
Bloomington, IL

Metalworking Fluids 130 is intended for chemists, engineers, technical support staff and field service technicians working with and using metalworking fluids. While processing parts using metalworking fluids, there is a need for treating, cleaning, and protecting chemical and/or coatings. Substrates either are immersed in these chemicals or have them applied during some point of the processing. This course covers heat treating, including oil and polymer quenching, cleaning parts and protecting parts from rust and corrosion. Individuals learn the basics of metallurgy as it applies to heat treating and quenching.

**Modules and Instructors include:**

**Metal Treating Fluids I:** John Duggan, DuBois Chemicals, Inc.,  
Detroit, MI

**Metal Treating Fluids II:** John Duggan, DuBois Chemicals, Inc.,  
Detroit, MI

**Metal Cleaning Fluid Chemistry:** Neil Canter, Chemical Solutions,  
Willow Grove, PA

**Parts Cleaning Fundamentals – Importance of Cleaning and Rinsing:** Suresh Patel, Chemetall, New Providence, NJ

**Paint Pretreatments:** Suresh Patel, Chemetall, New Providence, NJ

**Metal Protecting I:** Kimberly Kontra, Houghton International Inc.,  
Norristown, PA

**Metal Protecting II:** Kimberly Kontra, Houghton International Inc.,  
Norristown, PA

**Metal Protecting Dry Films:** Richard Butler, DuBois Chemicals,  
Bedford Park, IL



### Synthetic Lubricants 204: Base stock Selection and Applications

- **Legends G**

**Course Chair:** Vasu Bala, Tiarco Chemical, Dalton, GA

This course provides an introduction to synthetic lubricant base stocks and applications. It compares the use of these synthetic lubricants to petroleum-based products and compares between types of synthetic lubricants. Synthetic Lubricants 204 is a continuation from the Synthetic Lubricants 203: Non-Petroleum Fluids and Their Uses course, however, attendance of the Synthetic Lubricants 203 course is not a prerequisite.

**Modules and Instructors include:**

**Phosphate Esters:** Jatin Mehta, Fluitec International, Bayonne, NJ

**Food Processing Applications:** Tyler Housel, Zschimmer &  
Schwarz, Inc., Lansdale, PA

**Industrial Compressor Applications:** Glenn Short, BVA Inc.,  
Commerce Township, MI

**Transportation Applications:** Philip Ma, BASF Corp., Tarrytown, NY

**Gear Applications:** Larry Ludwig, Schaeffer Manufacturing Co.,  
St. Louis, MO

**Wind Turbine Applications:** Philip Ma, BASF Corp., Tarrytown, NY

**Synthetic Biolubricants:** Paula Vettel, Novvi, LLC, Emeryville, CA

### STLE Certification Exams

**Thursday, May 23 (8:30 am – Noon)**

- **Mockingbird 2**

All four STLE technical certifications exams: Certified Lubrication Specialist™, Oil Monitoring Analyst I and II™ and Certified Metalworking Fluids Specialist™ will be conducted concurrently. Individuals must be registered for exams in advance, however, onsite registration is available on a limited basis.

For more information, stop by the STLE Registration Desk in the Omni Nashville Hotel – Second Level Foyer. Registration and sign-in starts at 8:30 am. The exams start promptly at 9 am and takes approximately three hours to complete.

- **Exam Fees:**

First exam: \$440 (STLE member) | \$590 (Non-member)

Retake exam: \$220 (STLE member) | \$295 (Non-member)

## Authors and Presenters Invited to Attend Speakers Breakfast

Lead authors and education course instructors are invited to the Speakers Breakfast (Sunday through Thursday, May 19-23) from 7-7:45 am in the Omni Nashville Hotel – Legends D to meet with session and paper solicitation chairs (PSCs) for a continental breakfast on the days of their presentations. This is a great time to review the session schedule and note any last-minute changes. Speakers should plan on attending.





## 2019 STLE AWARD RECIPIENTS

*Given in recognition of outstanding achievement in the field of tribology and lubrication.  
All publishing awards are for papers printed in Tribology Transactions, STLE's peer-reviewed journal.*

### Publishing Awards

#### Edmond E. Bisson Award

The Bisson Award was named in honor of Edmond E. Bisson, a former STLE editor-in-chief who was instrumental in establishing the society's reputation as a technical publisher. Established in 1991, the award is given to STLE members or non-members for the best written contribution published by the society in the year preceding the Annual Meeting. The contribution must deal with tribology, lubrication engineering or allied disciplines.

- **Robert Fleming**, University of Arkansas (USA)
- **Min Zou**, University of Arkansas (USA)

***"Nanostructure-Textured Surfaces with Low Friction and High Deformation Resistance"***

#### Frank P. Bussick Award

The Bussick Award is presented for the most outstanding technical paper written on sealing systems technology and materials. The award is sponsored by the STLE Seals Technical Committee and honors a former committee chair and STLE board member.

- **Jan Duenas Dobrowolski**, Wroclaw University of Technology (Poland)
- **Marek Gawlinski**, Wroclaw University of Technology (Poland)
- **Maciej Paszkowski**, Wroclaw University of Technology (Poland)
- **Lars G. Westerberg**, Lulea University of Technology (Sweden)
- **Erik Höglund**, Lulea University of Technology (Sweden)

***"Experimental Study of Lubricating Grease Flow Inside the Gap of a Labyrinth Seal Using Microparticle Image Velocimetry"***

#### Walter D. Hodson Award

The Hodson Award was established in 1950 and is given to the lead author of the best paper written by an STLE member 35 years of age or younger and published by the society in the year preceding the Annual Meeting. The purpose of the award is to stimulate the interest of young engineers in the science of tribology and lubrication and the activities of STLE.

- **Alex-Florian Cristea** (\*lead author) Waukesha Bearings Corp./Dover Precision Components, (United Kingdom)
- **Jean Bouyer**, Institut Pprime-CNRS- Université De Poitiers (France)
- **Michel Fillon**, Institut Pprime-CNRS- Université De Poitiers (France)
- **Micrea D. Pascovici**, University of Bucharest (Romania)

***"Transient Pressure and Temperature Field Measurements in a Lightly Loaded Circumferential Groove Journal Bearing from Startup to Steady-State Thermal Stabilization"***

#### Wilbur Deutsch Memorial Award

The Deutsch Award is named for a former STLE president and recognizes the most outstanding technical paper written on the practical aspects of lubrication published by the society in the year preceding the Annual Meeting.

- **Tomonaga Oyamada**, Hitachi Ltd. (Japan)

***"Application of Ultrasonic Sensing to Monitoring Lubrication Conditions in a Refrigeration Compressor"***

#### Captain Alfred E. Hunt Memorial Award

Named for ALCOA's first president, this award is given annually to the STLE member or members authoring the best technical paper dealing with the field of lubrication or an allied field.

- **Yuxin Zhou**, University of Twente (Netherlands)
- **Rob Bosman**, University of Twente (Netherlands)
- **Piet M. Lugt**, University of Twente/SKF Engineering & Research Centre (Netherlands)

***"A Model for Shear Degradation of Lithium Soap Grease at Ambient Temperature"***

#### Al Sonntag Award

The Sonntag Award was established in 1983 and is given to an STLE member or members authoring the best technical paper on solid lubricants published by the society in the year preceding the Annual Meeting.

- **Soumya Gangopadhyay**, National Institute of Technology Rourkela (India)
- **Debajyoti Bhaduri**, University of Birmingham (United Kingdom)
- **Ajay Kumar Chattopadhyay**, Indian Institute of Technology Kharagpur (India)
- **Soumitra Paul**, Indian Institute of Technology Kharagpur (India)

***"Performance Evaluation of a Hard Composite Solid Lubricant Coating When Dry Machining of High-Carbon Steel"***



# 2019 STLE AWARD RECIPIENTS

## Industry Service Awards

### STLE International Award



★ **Dr. George E. Totten**  
G.E. Totten & Associates Inc.  
(USA)

The International Award, which was established in 1948, is STLE's highest technical honor and bestows lifetime honorary membership on the recipient, who need not have been a member of STLE. It is given in recognition of the recipient's outstanding contributions in tribology, lubrication engineering or allied fields.

### P.M. Ku Meritorious Award



★ **Dr. Michael T. Dugger**  
Sandia National Laboratories  
(USA)

The Ku Award was established in 1978 and is given to the STLE member who most typifies the dedicated spirit of the late P.M. Ku, who worked tirelessly to promote and advance the mission of STLE. The award has been established to recognize outstanding and selfless achievement on behalf of STLE. To qualify for the honor, the recipient must have been a member of the society for at least 15 consecutive years and performed extensive active, dedicated service.

### Vic Joll Award



★ **Alene Urda**, Ford Motor Co. (USA) – Retired  
(STLE Detroit Section)

The Vic Joll Award recognizes outstanding and selfless contributions by a member of an STLE local section. It is given to a section member who has worked tirelessly and continuously for the benefit of the section, devoting numerous hours in the performance of many tasks necessary to promote and advance the mission of the section and of STLE. The award is named in honor of the late Vic Joll, 1978-79 STLE president who championed local sections.

### 2019 STLE Fellows

STLE Fellows are persons of outstanding personal achievement in the field of tribology or lubrication engineering who have 20 years of active practice in the science and/or engineering professions and have been an STLE member for 10 years. They are nominated by the Fellows Committee and approved by the STLE board of directors.



★ **Dr. Neil Canter**  
Chemical Solutions (USA)



★ **Dr. Masabumi Masuko**  
Tokyo Institute of Technology  
(Japan)



★ **Prof. Joichi Sugimura**  
Kyushu University (Japan)



★ **Dr. Ian Taylor**  
Shell Global Solutions UK  
(United Kingdom)



★ **Prof. Philippe Vergne**  
LaMCoS INSA Lyon – CNRS  
(France)



★ **Dr. Martin Webster**  
ExxonMobil Research &  
Engineering (USA)



★ **Dr. Eugene White**  
Independent Consultant  
(USA)



★ **Dr. Jack Zakarian**  
JAZTech Consulting, LLC  
(USA)

## Student Scholarships & Awards

### Presidential Awards Program

STLE grants three academic awards through its Presidential Awards Program: The Elmer E. Klaus Fellowship (graduate students), The E. Richard Booser Scholarship (undergraduate students) and The Jeanie S. McCoy Scholarship (female undergraduate or graduate students). These awards are administered by the STLE Presidential Council and are meant to encourage students to pursue an advanced degree or a career in tribology or lubrication engineering by subsidizing a research project related to the field.



**The Elmer E. Klaus Fellowship** ★ **Margot Farnham**, The University of Delaware (USA)



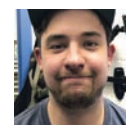
**The E. Richard Booser Scholarship** ★ **Robert Elkington**, University of Southampton (UK)



**The Jeanie S. McCoy Scholarship** ★ **Kathryn Hasz**, The University of Pennsylvania (USA)

### Early Career Awards

The Early Career Awards recognize the technical achievements of STLE student members, postdoctoral researchers, junior-level academic faculty and industry professionals and provides financial support for attendance to the STLE Annual Meeting.



**Student**  
**Tomas Babuska**  
Lehigh University (USA)



**Postdoctoral Researcher**  
**Dr. Kalyan Mutyala**  
Argonne National Laboratory  
(USA)



**Academic Professional**  
**Alison C. Dunn**  
University of Illinois at  
Urbana-Champaign (USA)



**Industry Professional**  
**Shilpa Beesabathuni**  
Houghton International Inc.  
(USA)

# Overview



Please check the errata in your registration bag to verify course times. Some times might change slightly.

## SUNDAY, MAY 19

**Registration** (7 am – 6 pm) – Second Level Omni Foyer

**Education Course Faculty Breakfast** (7 – 7:45 am) – Legends D

**Sunday Education Courses\*** (8 am – 5 pm)

- ABMA Bearings – Cumberland 4
- Advanced Lubrication 301: Advanced Additives – Cumberland 5/6
- Advanced Tribology 310: Nanotribology – Mockingbird 1
- Automotive Lubrication 201:- Diesel – Cumberland 1
- Biolubricants and Biofuels – Cumberland 2
- Hydraulics 201: Hydraulic Fluids and Systems Overview – Cumberland 3
- Metalworking Fluids 115: Metal Removal Fluids – Legends A/B
- Synthetic Lubricants 203: Non-Petroleum Fluids and Their Uses – Legends C

## MONDAY, MAY 20

**Registration** (7 am – 6 pm) – Second Level Omni Foyer

**Monday Speakers Breakfast** (7 – 7:45 am) – Legends D

**Monday Technical Sessions** (8 – 10 am)

- 1A ● Materials Tribology I – Legends A
- 1B ● Lubrication Fundamentals I – Legends B
- 1C ● Engine and Drivetrain Special Session on Electric Vehicles I – Legends C
- 1D ● Gears I – Music Row 1
- 1E ● Commercial Marketing Forum I – Music Row 5
- 1G ● Wind Turbine Tribology I – Music Row 3
- 1J ● Nanotribology I – Cumberland 3
- 1K ● Metalworking Fluids I – Cumberland 4
- 1L ● Nonferrous Metals I – Cumberland 5
- 1M ● Fluid Film Bearings I – Cumberland 6

**Opening General Session** (10:30 am – Noon)

- **Keynote Address** – Legends Ballroom
- **Speaker:** Jeff Hemphill, Chief Technical Officer, Americas, Schaeffler Group USA Inc.

**Lunch** on your own (Noon – 1:30 pm)

**Commercial Exhibits and Student Posters**

(Noon – 5 pm) – Broadway Ballroom

**Monday Technical Sessions** (1:30 – 6 pm)

- 2A ● Materials Tribology II – Legends A
- 2B ● Lubrication Fundamentals II – Legends B
- 2C ● Engine & Drivetrain Special Session on Electric Vehicles II – Legends C
- 2D ● Gears II – Music Row I
- 2E ● Commercial Marketing Forum II – Music Row 5
- 2G ● Wind Turbine Tribology II – Music Row 3
- 2H ● Testing in Soft Tribology – Tribotesting & Materials Joint Session – Music Row 2
- 2J ● Nanotribology II – Cumberland 3
- 2K ● Metalworking Fluids II – Cumberland 4
- 2L ● Nonferrous Metals II – Cumberland 5
- 2M ● Fluid Film Bearing II – Cumberland 6

**Beverage Break** (10 – 10:30 am) – Legends Ballroom Foyer

**Exhibitor Appreciation Break** (3 – 4 pm) – Broadway Ballroom

**Networking Reception** (6:30 – 8 pm) – Legends Ballroom

## Exhibition Hours

- **Monday, May 20** (Noon – 5 pm)  
**Exhibitor Appreciation Hour** (3 – 4 pm)  
Evonik Raffle (3:30 pm) – Must be present to win.